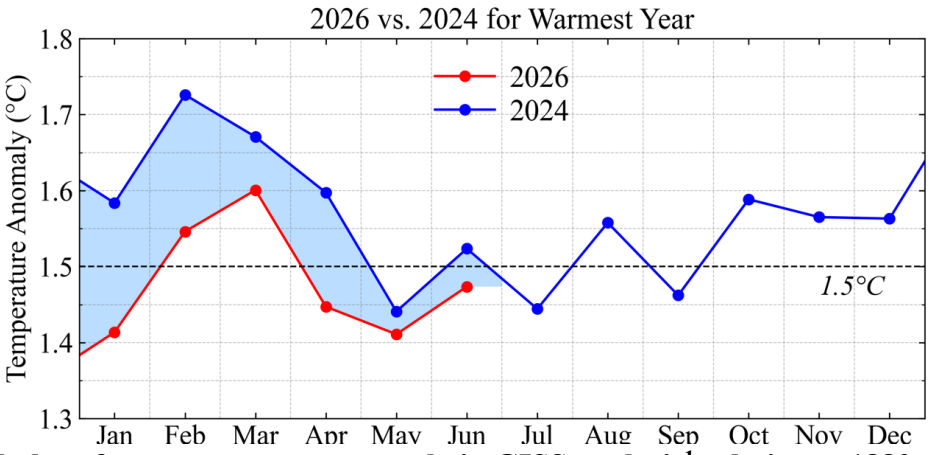

Fig. 1. Global surface temperature anomaly in GISS analysis[1] relative to 1880-1920 mean.

Beware Media Hype. It's Not the El Nino!

23 July 2026

James Hansen, Pushker Kharecha, Dylan Morgan and Jasen Vest

Abstract. Emerging climate extremes should draw public attention to human-caused climate change. We expect unusual sea surface temperature (SST) and global warming the rest of this year to make 2026 hotter than 2024, despite 2024 being a peak El Nino year, while 2026 is only the lead-in year of an emerging El Nino. Beware the "surprise" record high being blamed on an extreme El Nino on top of global warming otherwise consistent with IPCC estimates. Instead, record warmth provides additional evidence of high climate sensitivity and increased net climate forcing in the past decade. These two factors are driving an unusual increase in global SSTs with major consequences. If you bear with our discussion to the end, you will find some possible good news. Figures in this post are continually updated on our website.[2] We are now on Substack[3].

June this year was cooler than June 2024, making it the sixth consecutive month this year with a lower global temperature than its 2024 counterpart (Fig. 1). 2026 fell another half "length" behind 2024 and now trails the record warm year by 6.5 lengths, if we define a length as 0.1°C-months.[4] We expect 2026 global temperatures in the remaining 6 months of the year to exceed their 2024 counterparts by more than 6.5 lengths. That's a tall order, because 2024 continued to be exceptionally hot in the second half of the year. We explained the basis for our expectation in our prior communication[5] and will reiterate the reasons briefly below, but first let us note why it is important that the media not be allowed to misrepresent reality.

The climate threat. For several reasons, it is hard for people to realize how serious the climate threat is and to take appropriate, timely actions. First, climate change is delayed by the thermal inertia of the ocean, which means that additional change is in the pipeline before the public sees large climate impacts. Second, most emissions driving climate change result from essential activities such as energy production and agriculture. Fossil fuels, for example, have raised living standards, and replacing that infrastructure takes time. Third, there are special interests that resist change and spread disinformation. Therefore, it is important that we clarify the physical basis for our expectations. We can learn something from predictions – right or wrong – only if we make clear what the predictions are based on, beyond simple statistics.

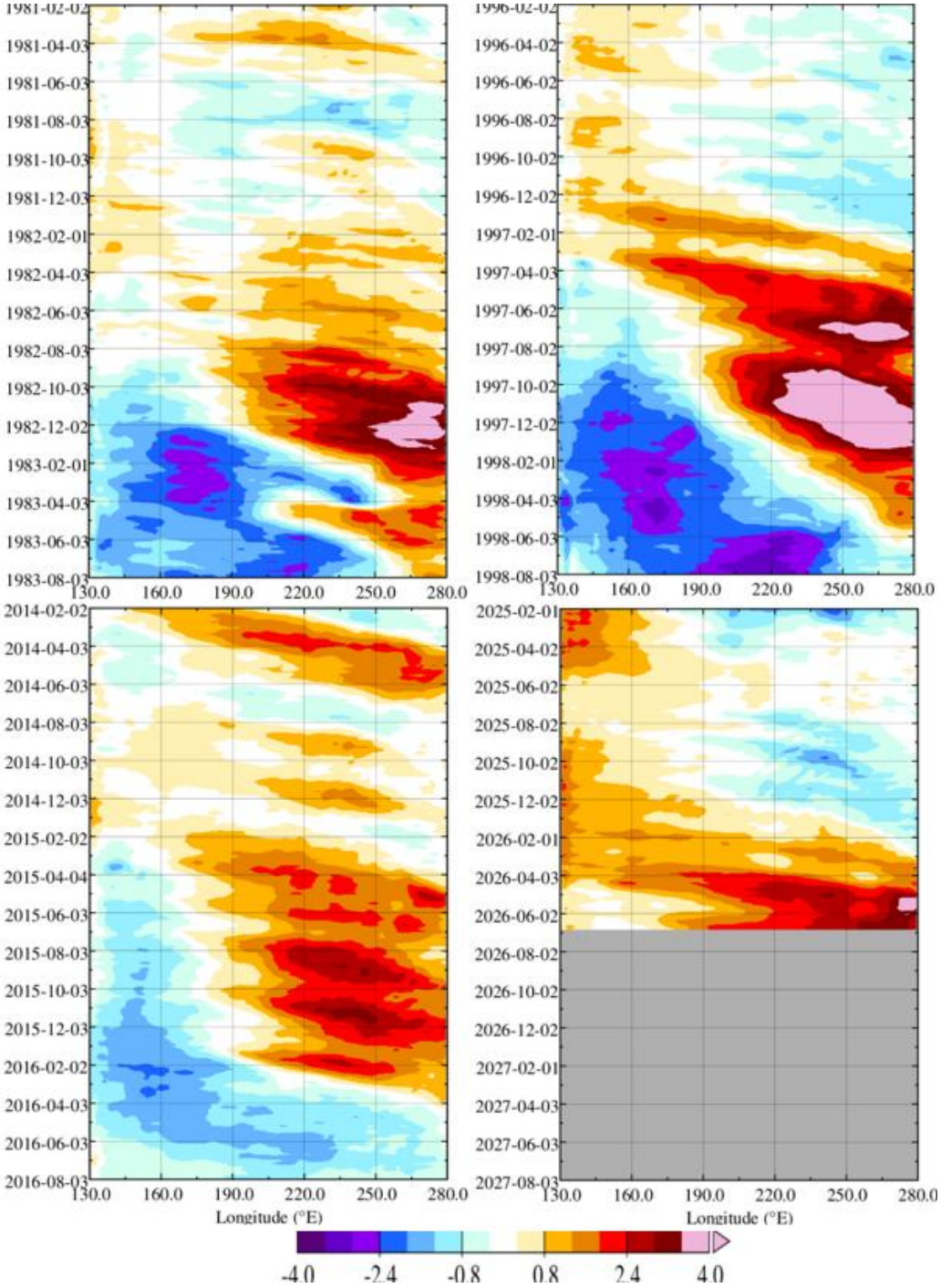

Fig. 2. Equatorial Pacific upper 300 m (0.16°N-0.16°S) temperature vs time and longitude.

The budding 2026-27 El Nino, lower right of Fig.2, is compared with the other strong El Ninos (1982-83, 1997-98, 2015-16) in the period with good upper ocean data. We need several more months of data to assess how strong the current El Nino is relative to the other strong El Ninos, but it will be difficult for it to match the strength of the 1997-98 El Nino. The current El Nino seems to be emerging from a warmer western Pacific Ocean. The tropical ocean mixed layer is much thinner than 300 m, yet is it possible that accelerated global warming in the past decade and tropical storms have warmed the upper 300 m in the Western Pacific? Is the rapid return of El Nino, just 3 years after the 2023-24 El Nino, related to increased warmth in the Western Pacific?

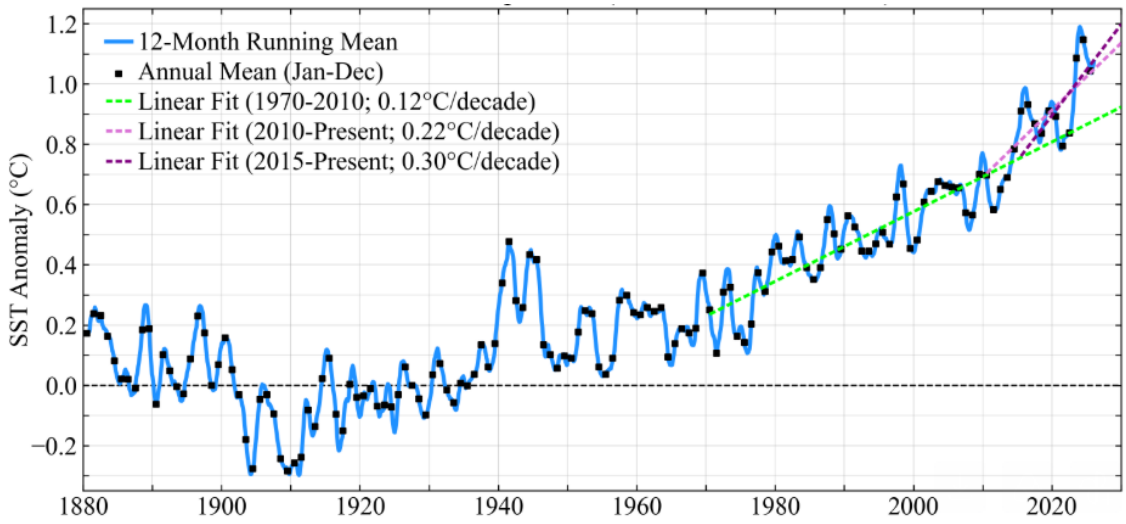

Fig. 3. Sea surface temperature (relative to 1880-1920 base period).[1]

Global sea surface temperature (SST) increased rapidly in the last decade (Fig. 3). [*Note: Early data suffer from poor coverage and other problems, e.g., high 1940-1946 temperature is in part an artifact of inhomogeneous data records*.[6]] The SST increase is about three-quarters of the global temperature increase (Fig. 4); as shown in graphs on our website (temperature increase over land is a factor of two larger than the SST increase and the global temperature increase is about 1.33 times the SST increase). The acceleration of global warming in the last decade requires that the growth rate of the net climate forcing in the last decade was at least double its value in 1970-2010. Let's examine what that implies. To a good accuracy, the net human-made forcing is the sum of the GHG (greenhouse gas) and aerosol forcings (Fig. 5). The GHG forcing is known accurately, and there has been no large change in its growth rate in the past decade that could account for accelerated global warming. The aerosol forcing is unmeasured.

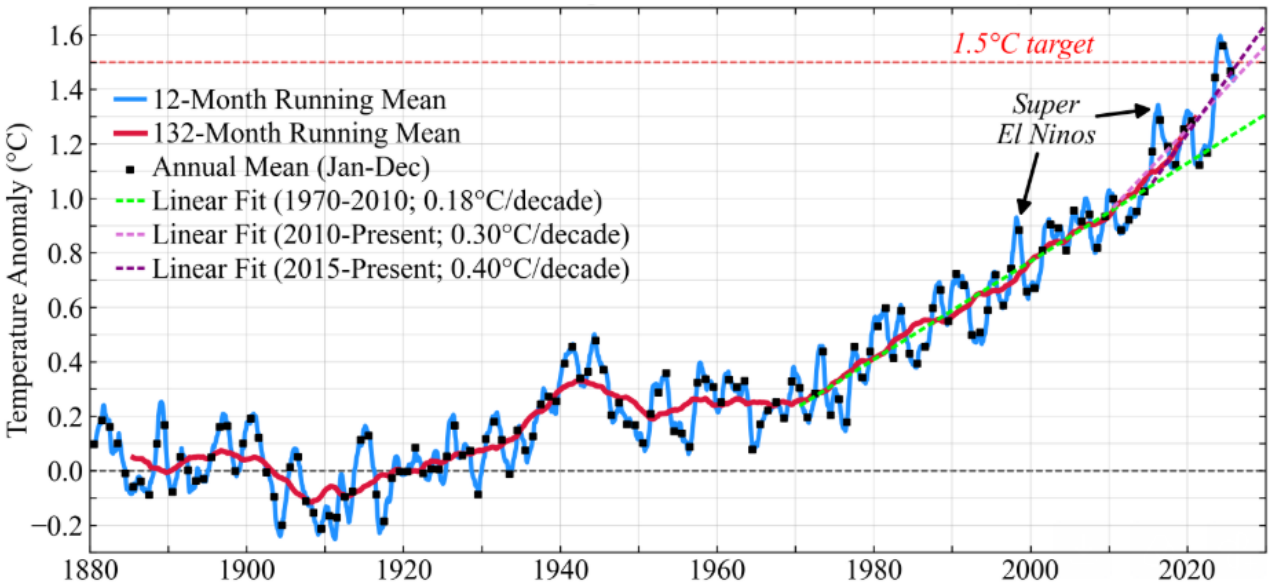

Fig. 4. Global surface temperature (relative to 1880-1920 base period).[1]

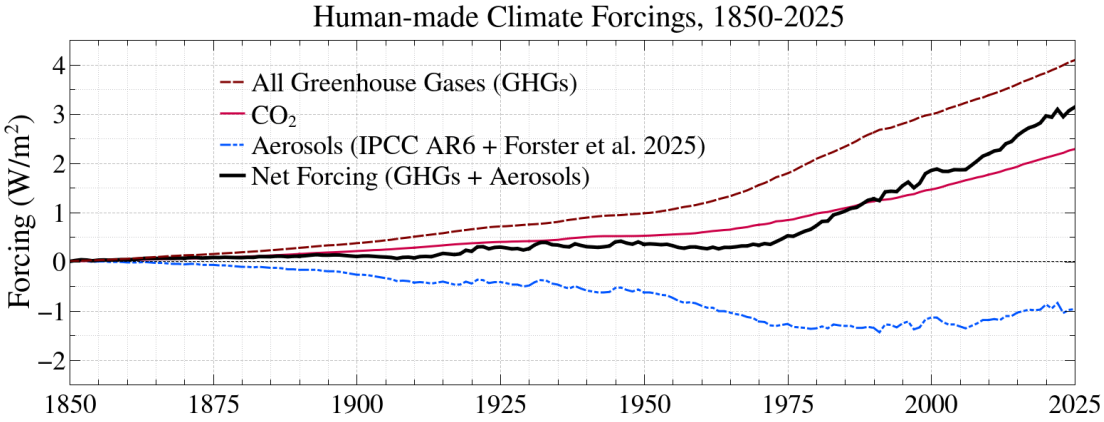

Fig. 5. All Greenhouse gases, CO_2, aerosol, and net climate forcings.[7,8,9,10]

Aerosol forcing in Fig. 5 is the IPCC (Intergovernmental Panel on Climate Change) best estimate. The important characteristic is that the estimated aerosol forcing changed little during 1970-2005. In that case, observed global warming of 0.18°C per decade (Fig. 4) was driven almost entirely by GHG forcing, which in turn would imply that climate sensitivity is near 3°C for doubled CO_2. That result was almost foreordained by the IPCC approach to climate analysis, which places overwhelming emphasis on GCM (global climate model) simulations and interpretation of climate change in the past two centuries. IPCC reports implicitly involve GCM beauty contests, in which model simulations are compared with observed global temperature in the past 1-2 centuries. If the aerosol forcing is unchanging during the period 1970-2005 as in Fig. 5, the climate sensitivity required to match the observed global warming rate post 1970 is about 3°C for doubled CO_2. That is the easiest climate sensitivity to achieve in GCMs, with little, if any, amplifying cloud feedback. Given the many uncertain parameters and choices in a GCM, in choosing a version of the model that gives reasonable agreement, the choice of model parameters is set so as to yield a climate sensitivity near 3°C for doubled CO_2. Everyone was then fat and happy: the models yielded global warming in the right ballpark and the average model sensitivity was near 3°C for doubled CO_2.

Unfortunately, there was a fly in the ointment. IPCC's overwhelming focus on GCMs and global warming of the past century resulted in one dominant constraint on the models: the need to obtain global warming of about the observed magnitude. However, there were two uncertain parameters: climate sensitivity and the unmeasured aerosol forcing. The basis for believing that the aerosol forcing was unchanging during 1970-2005 was the fact that the estimated sulfur content of fossil fuels burned in that period was nearly constant and sulfate aerosols are the dominant human-made aerosol. If the aerosol forcing were simply due to reflection of sunlight by the aerosols per se, constant aerosol forcing would have been a good approximation. However, much, probably most, of the aerosol forcing is via the effect of aerosols on clouds, and that effect is very nonlinear. Adding aerosols to a pristine atmosphere has more effect on clouds than adding aerosols to already heavily polluted air. Prior to 1970, the U.S. and Europe were the main sources of increasing aerosols, but in the next few decades emissions there began to decline as emissions rose in Asia and as ship traffic became extensive over a greater ocean area. Thus, aerosol forcing became stronger. Although aerosol-cloud models are primitive, the most realistic of the Bauer et al. models found a continuing decline of −0.5 W/m^2, reducing the decadal (GHG + aerosol) forcing from about +0.45 W/m^2 to +0.3 W/m^2/decade. Then, because China reduced aerosol emissions and ships were required to use low sulfur fuel, the aerosol change in the past decade had the opposite sign and the net GHG + aerosol forcing growth rate at least doubled to +0.6 W/m^2/decade.

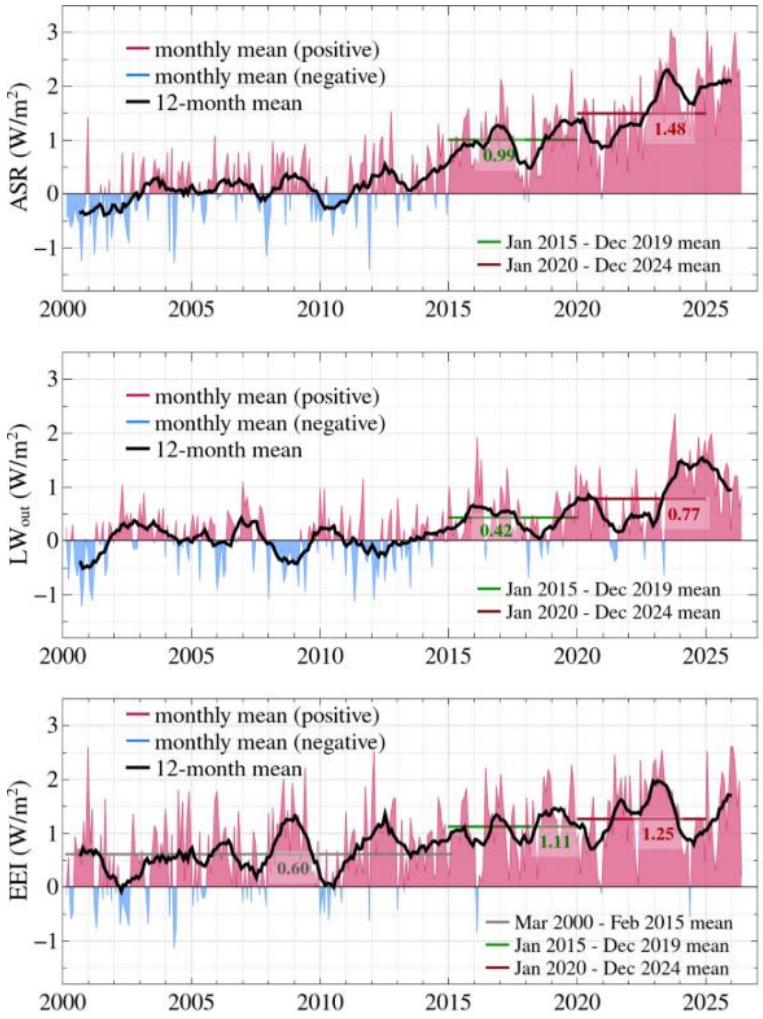

Fig. 6. Earth's satellite-observed absorbed solar radiation (ASR) and longwave (thermal) emission to space (LW),[11] both relative to their 2000-2010 averages, and the absolute Earth energy imbalance (EEI) calibrated with aid of Argo-measured heat storage in the ocean.[12]

Confirmation of our interpretation is necessarily indirect, given the absence of global monitoring of the aerosol climate forcing. One of the strongest pieces of evidence is provided by satellite measurements of Earth's energy balance calibrated by measurements of heat storage in the ocean (Fig. 6). A remarkable decrease of Earth's albedo (reflectivity) and thus increase of solar radiation absorbed by Earth began in 2010-2015 (upper panel of Fig. 6). Earth responds to accelerated warming by emitting more heat to space (middle panel), but because the ocean requires time to approach a new equilibrium temperature, the increase in net climate forcing has pushed Earth farther out of energy balance. The current imbalance (past decade) is roughly twice the average imbalance during the first 15 years of this century (lower panel of Fig. 6). As long as the planet is this far out of energy balance, the accelerated rate of global warming will continue.

Further support of our interpretation is provided by several independent evaluations supporting climate sensitivity in the range 4-5°C for doubled CO_2.[13] With such high climate sensitivity, the observed post-1970 warming rate implies the existence of a negative forcing stronger than assumed by IPCC et al. Indeed, the zonal-mean absorbed solar radiation reveals strong midlatitude increases of absorbed solar radiation (see Fig. A1 in the Appendix below) that can only be provided by reduced cloud albedos, consistent with high climate sensitivity.

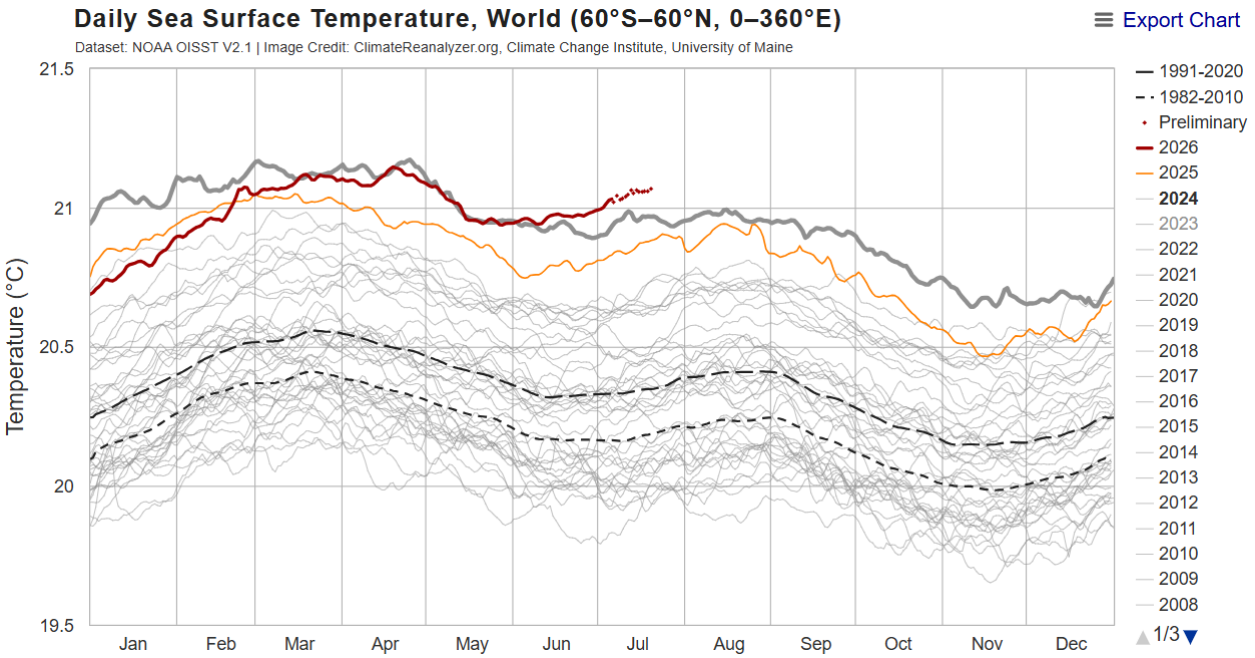

Fig. 7. NOAA OISST V2.1 The red curve is 2026; the heavy grey curve is 2024. Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine.

Global SST in 2026 (red curve in Fig. 7) is now at a record high for the date. We compare 2026 with the record warm 2024, shown by the heavy grey curve in Fig. 7. Correlations of land, ocean, and global temperature anomalies (Fig. 8) show that the land anomalies lag the ocean anomalies by three months. This is the expected sense of the lag, as the El Nino/La Nina cycle is the principal source of global temperature variability and its influence on continental temperature grows over a period of several months. Global (land plus ocean) temperature lags SST by about 1.5 months, as the maximum correlation is 0.92 at both 1-month and 2-month lags. The 2026 global SST surpasses the 2024 global SST by mid-June; thus, given the lag, 2024 might remain warmer than 2026 in July, but the final five months of the year should have 2026 as warmer than 2024. We expect the gap in the stretch run (November, December) to be so large as to (unfortunately) make 2026 the hottest year – until 2027, which will be even hotter.

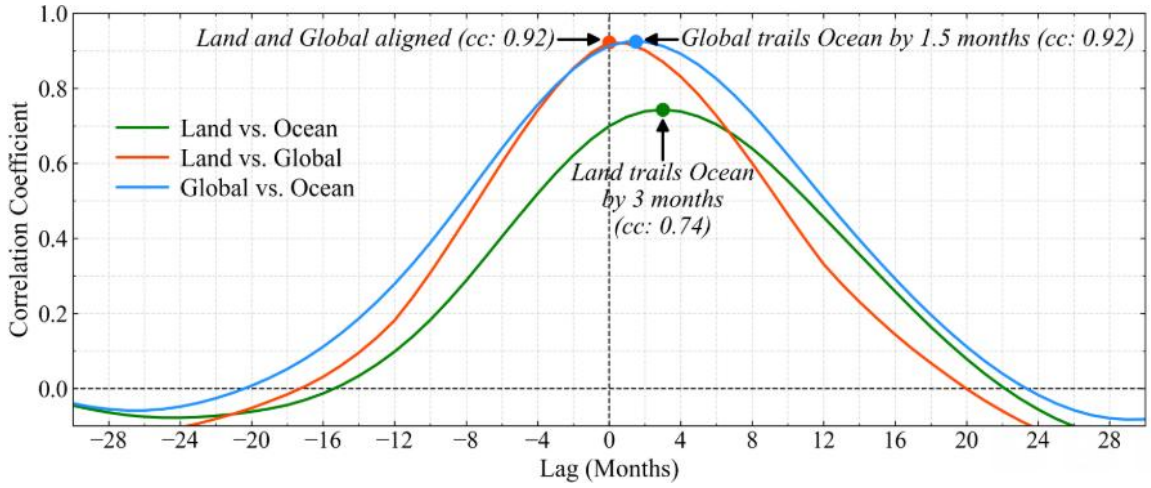

Fig. 8. Correlation of global, ocean, and land temperature anomalies of GISS/NOAA data.[1]

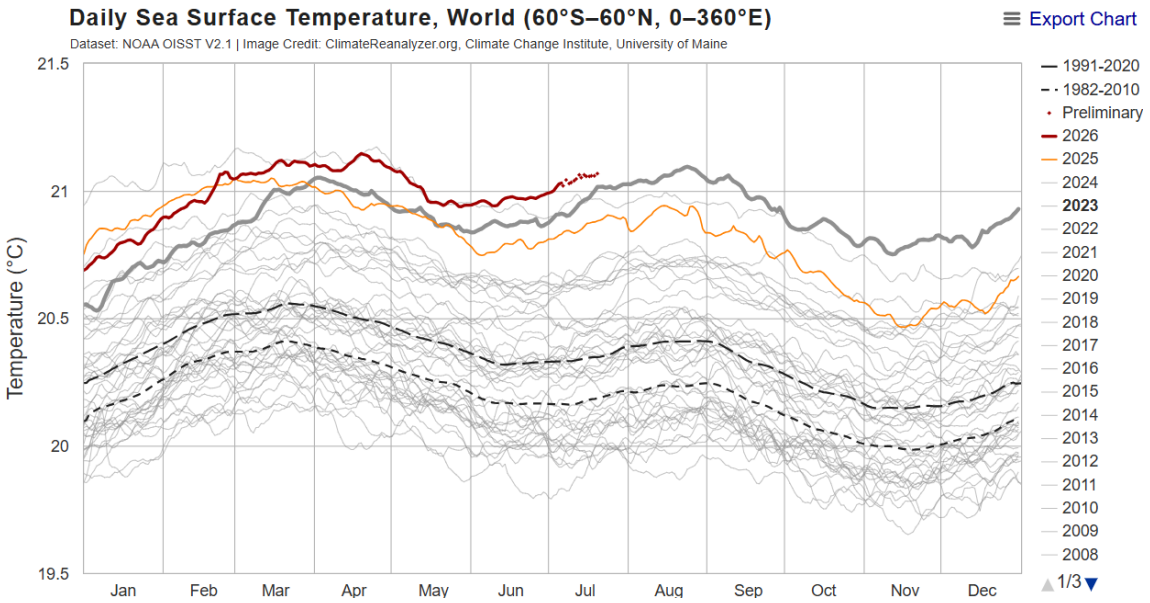

Fig. 9. NOAA OISST V2.1 The red curve is 2026; the heavy grey curve is 2023. Image Credit: ClimateReanalyzer.org, Climate Change Institute, University of Maine.

Now let's search for good news. What we hope is that the accelerated warming rate will slow down. We would like to see the gap between the two El Nino lead-in years (2026 and 2023) begin to narrow. There is perhaps a hint of a decrease in the gap (Fig. 9).

There are reasons to hope that the warming rate might slow down. For one thing, in 2023 solar irradiance was rising toward solar maximum of the ~11year solar cycle, while in 2026 the solar irradiance is declining. [We will present data for all the known climate forcings in an upcoming communication.] The solar variations are small, but not negligible. The maximum global temperature anomaly caused by the solar cycle occurs about a year after the maximum irradiance, which was about a year ago.

O.K., so we were grasping for straws. We didn't really have good news. If we want the accelerated warming to slow down, we must get Earth's energy imbalance (lower panel of Fig. 6) to decrease. That means the world needs to get serious about reducing the humanmade climate forcing, and the world has not got very serious yet. Sorry, we will keep searching for some good news in our planet's data.

Appendix

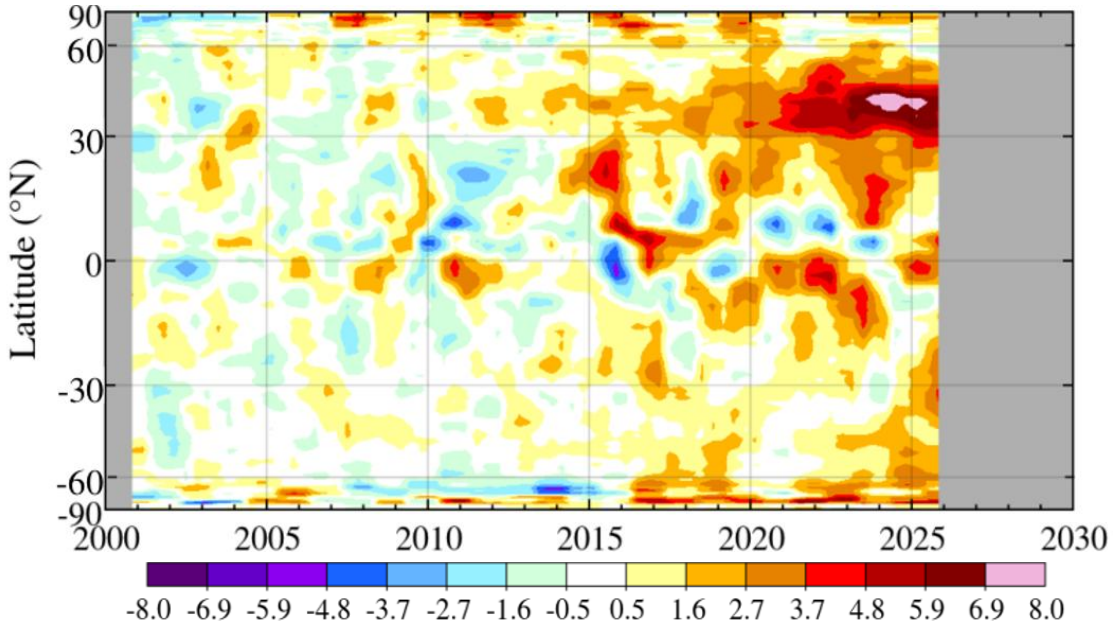

Fig. A1. Zonal-mean Absorbed Solar Radiation over the ocean (W/m^2).

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[1] Temperature is from Goddard Institute for Space Studies analysis described by Hansen J, Ruedy R, Sato M *et al.* Global surface temperature change, *Rev Geophys* **48**, RG4004, 2010; Lenssen NJL, Schmidt G, Hendrickson M *et al*. A NASA GISTEMPv4 Observational Uncertainty Ensemble, *J Geophys Res Atmos* **129**, e2023JD040179, 2024

[2] Our communications (posts) and data are available now via Hansen's website while we continue to develop and populate our websites and data pages. Figures in communications and papers that remain of current interest will be updated at appropriate intervals, usually monthly, with the most recent date of update indicated on the website.

[3] https://jimehansen.substack.com/

[4] For example, in January, 2024 was about 0.17°C warmer than 2026, so it pulled 1.7 lengths ahead the first month and has been stretching its lead every month. This definition gives a bit too much weight to February, but we want a simple horse race analogy and the variable month length will come out in the wash at the end of the year.

[5] Hansen J, Kharecha P, Morgan D, Vest J. 2026 On Track for Warmest Year, 30 April 2026

[6] Hansen J, Sato M, Kharecha P, von Schuckmann K, Beerling DJ, Cao J, Marcott S, Masson-Delmotte V, Prather MJ, Rohling EJ, Shakun J, Smith P, Lacis A, Russell G, Ruedy R, Young people's burden: requirement of negative CO2 emissions, *Earth Syst Dynam* **8**, 1-40, 2017.

[7] Intergovernmental Panel on Climate Change (IPCC). *Climate Change 2021: The Physical Science Basis [Masson-Delmotte V, Zhai P, Pirani A et al. (eds)].* Cambridge and New York: Cambridge University Press, 2021

[8] Forster PM, Smith C, Walsh T *et al*. Indicators of global climate change 2024: annual update of key indicators of the state of the climate system and human influence, *Earth Syst. Sci. Data* **17**, 2641-80, 2025 https://essd.copernicus.org/articles/17/2641/2025/essd-17-2641-2025-supplement.pdf

[9] The CO_2 and all GHG forcings are based on the formulae in reference 10, but it is shown in reference 10 that our GHG forcings are in close agreement with those of IPCC (reference 7).

[10] Hansen JE, Sato M, Simons L *et al*. "Global warming in the pipeline," *Oxford Open Clim. Chan.* 3 (1) (2023): doi.org/10.1093/oxfclm/kgad008

[11] Loeb NG, Johnson GC, Thorsen TJ *et al*. Satellite and ocean data reveal marked increase in Earth's heating rate. *Geophys Res Lett* **48**, e2021GL093047, 2021

[12] von Schuckmann K, Cheng L, Palmer MD *et al*. Heat stored in the Earth system: where does the energy go? *Earth Sys Sci Data* **12**, 2013-41, 2020

[13] Hansen J, Kharecha P, Morgan D, Vest J., Yes, 2026 is on Track to be the Hottest Year, 12 June 2026